

PRELIMINARY DATA SUMMARY

July 1988

U.S. Army Engineer Waterways Experiment Station  
Coastal Engineering Research Center  
Field Research Facility  
Duck, North Carolina

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CERC Field Research Facility  
Duck, North Carolina

This report provides a summary of basic oceanographic, meteorological and bottom profile data for the month. The data were obtained as part of the Field Research Facility Measurement and Analysis Work Unit at the U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's Field Research Facility (FRF) in Duck, North Carolina. The FRF staff collected and analyzed these data. These summaries are intended to make the data readily available to all FRF users, and comments on their content and usefulness are invited.

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## PART I: INTRODUCTION

The U.S. Army Engineer Waterways Experiment Station, Coastal Engineering Research Center's (CERC's) Field Research Facility (FRF) is located on the Outer Banks of North Carolina, near the village of Duck (Figure 1).

The FRF research program provides a means for obtaining high-quality field data, particularly during storms, in support of the U.S. Army Corps of Engineers' coastal engineering research missions. The research pier is a reinforced concrete structure supported on 0.9-m-diam steel piles spaced 12.2 m apart along the pier's length and 4.6 m apart across the width. The pier deck is 6.1 m wide and extends from behind the duneline to about the 6-m water depth contour at a height 7.6 m above the National Geodetic Vertical Datum (NGVD). In addition, a main building contains offices, an instrument repair shop, and a data acquisition room.

One of the responsibilities of the FRF research program is the collection, analysis and dissemination of data on local oceanographic and meteorological conditions. Bottom profiles along both sides of the pier and periodic bathymetric surveys are also performed.

This summary is intended to provide basic data as soon as possible after they are obtained. Questions and/or comments concerning the data may be directed to Mr. Herman C. Miller at (919) 261-3511.

Part II presents the meteorological data; Parts III through VI present oceanographic data; Part VII presents nearshore profiles and bathymetry; and Part VIII, if included, documents special events that occurred at the FRF during the month.

Table 1 is a list of instruments used, their operational status during the month, and the data collection status. Figure 2 identifies the location of the instruments. The water depths at the wave gages and current meters vary and may be determined from information contained in Figure 7. Other installation information is contained in Table 1.

Times given in the report, unless otherwise specified, are referenced to eastern standard time (EST).

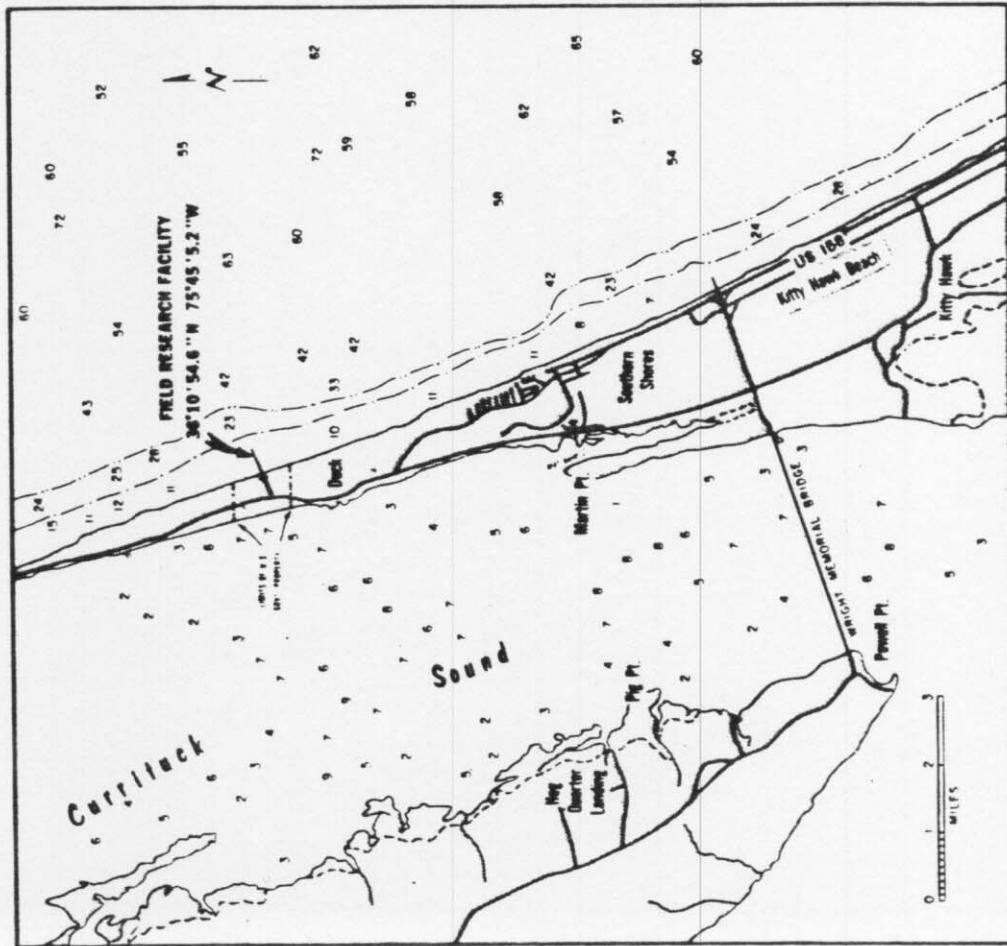
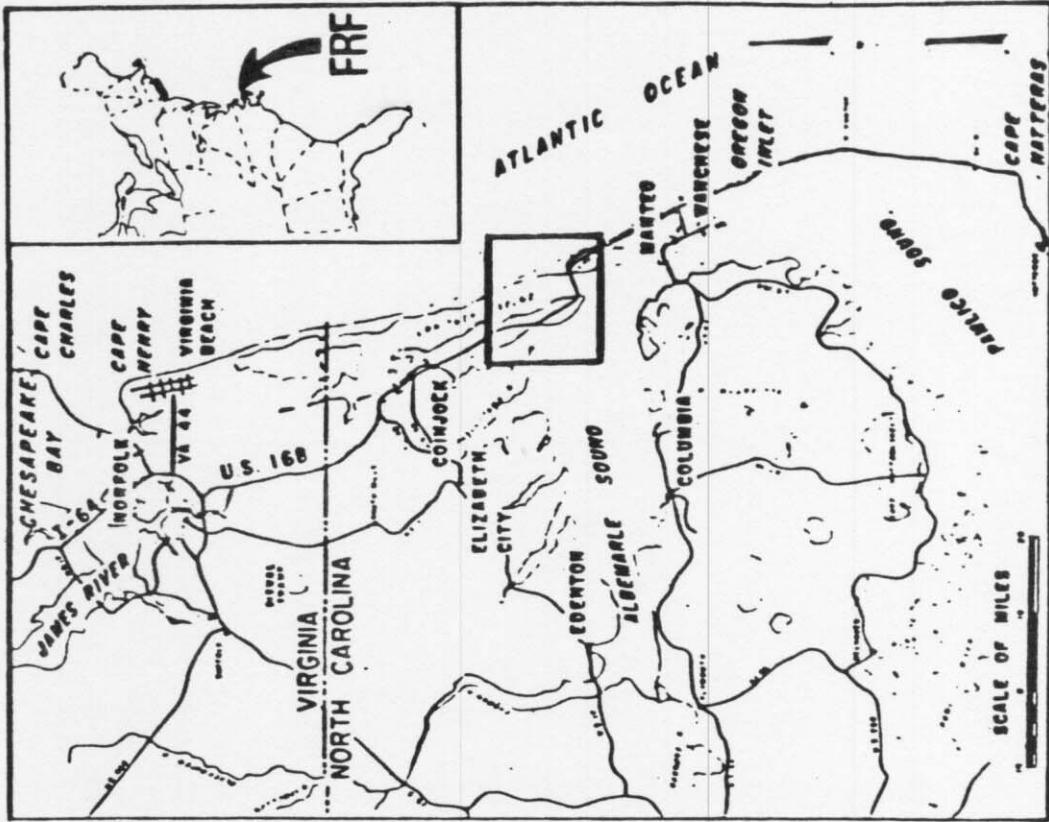


Figure 1. FRF location map

Table 1: Instrument Status/Data Availability

JUL 1988

Gage ID	Description/Remarks	Depth at Sensor	Day of the month																																				
			1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1						
616	Barometric Pressure		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
			Analog Record	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
604	Precipitation		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
624	Air Temperature		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
632	Anemometer on Laboratory Building Elevation 19 m (NGVD)		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
			Analog Record	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
645	Baylor staff at station 7+80 on FRF pier	see Figure 7	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
625	Baylor staff at station 19+00 on FRF pier	see Figure 7	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		
			Data Collected	/	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
111	Pressure gage 309 m north of FRF pier (0.9 km offshore)	Approx. 7.8 m NGVD	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
630	Waverider buoy 6.0 km offshore	Approx. 23 m NGVD	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
679	Current meter 500 m south of FRF pier (0.5 km offshore)	see Figure 7	Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
865-1370	NOAA tide station at seaward end of FRF pier		Gage Status	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
			Data Collected	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Supplemental Observations (daily oceanographic and meteorological observations)			Daily observation	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	

Gage Status	Daily Observation	Analog Record	Data Collected
Operational = *	Complete = *	Complete = *	All = *
Partial = /	Partial = /	Partial = /	Partial = /
Non-Operational = -	None = -	None = -	None = -

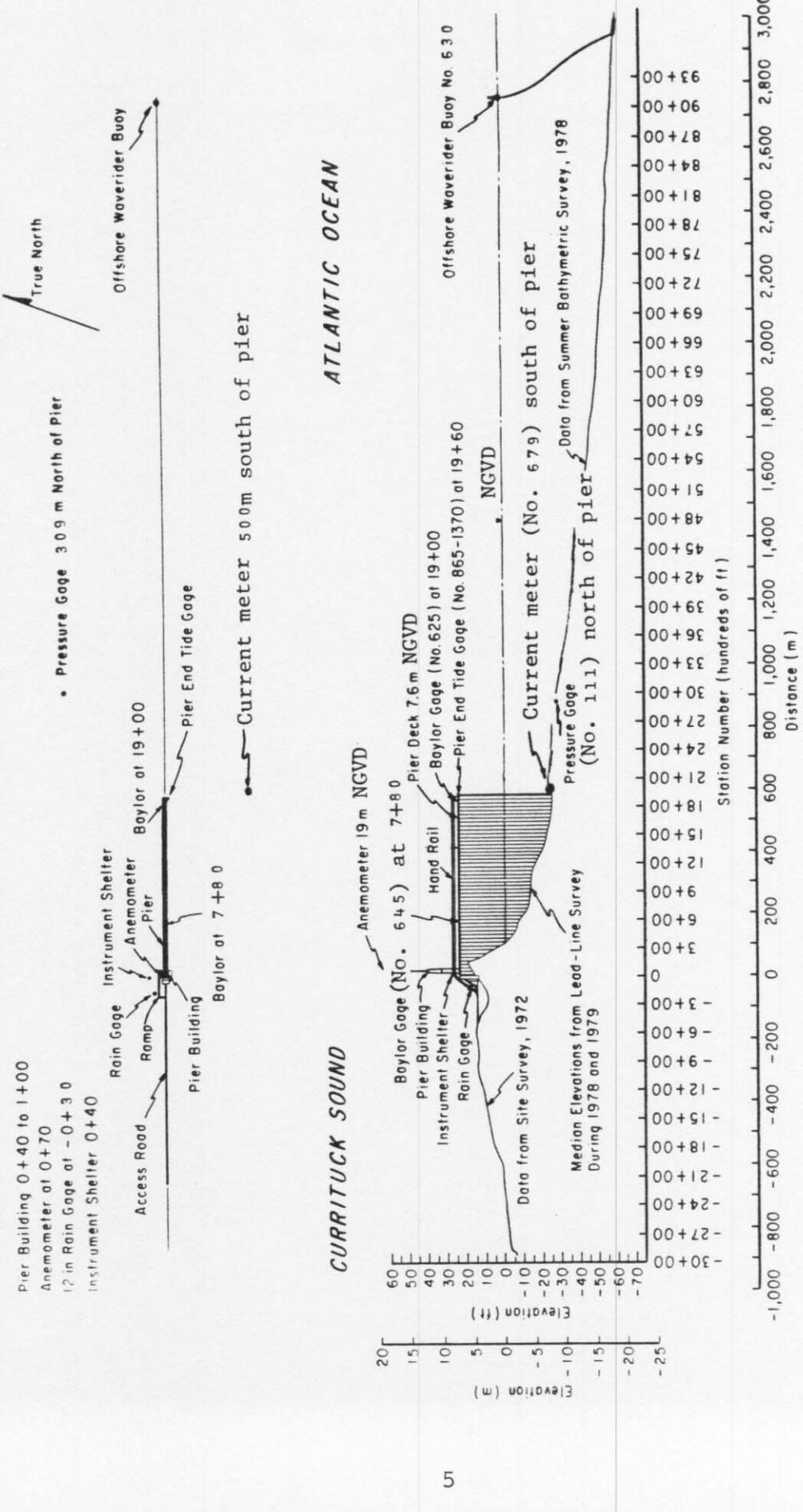


Figure 2. Instrument locations at FRF

## PART II: METEOROLOGICAL DATA

A variety of instruments have been installed at the FRF (Figure 2) to monitor the meteorological conditions. The data presented in Table 2 are collected and stored on magnetic tape using a Digital Equipment Corporation VAX 11/750. For each instrument identified in Table 1 as having analog outputs, chart records are obtained, a log is maintained and the records are stored for future reference.

Winds were measured on top of the laboratory building at an elevation of 19 m (Figure 2) using a Weather Measure Skyvane anemometer.

Monthly resultant wind speeds and directions are determined by vector averaging the data. Temperature and atmospheric means are the average of the values presented for the month. Total precipitation is the sum for the month.

The following may be useful for converting the data in Table 2 to other frequently used units of measurement:

1. Millimeters (mm) to inches (in.) -  
 $mm \times .03937 = in.$
2. Millibars (mb) to inches of mercury (in. Hg) -  
 $mb \times 0.02953 = in. Hg$
3. Degrees Celsius (C) to degrees Fahrenheit (F) -  
 $(C \times 9/5) + 32 = F$
4. Meters per second (m/s) to knots (kn) -  
 $m/s \times 1.943 = kn$

Table 2: Meteorological Data

JUL 1988

Day	Hour	Wind Speed m/sec	Wind Direction deg TN	Temperature deg C	Atm Pressure mb	Precipitation mm
1	100	3	239	20.3	1008.1	0
	700	10	11	19.1	1009.8	0
	1300	8	5	20.8	1010.4	0
	1900	1	11	20.2	1011.1	0
2	100	6	284	20.3	1012.8	0
	700	5	291	20.5	1014.8	0
	1300	3	88	24.3	1015.5	0
	1900	5	129	21.6	1014.8	0
3	100	4	161	19.6	1016.2	0
	700	3	201	23.3	1017.5	0
	1300	2	206	28.0	1017.9	0
	1900	6	146	23.1	1017.9	0
4	100	2	147	21.2	1020.3	0
	700	3	125	24.0	1021.9	0
	1300	5	102	25.9	1023.6	0
	1900	5	83	22.7	1023.6	0
5	100	1	104	19.9	1024.3	0
	700	5	54	22.9	1025.7	0
	1300	6	59	24.7	1026.7	0
	1900	4	53	22.2	1024.7	0
6	100	4	64	21.4	1024.0	0
	700	4	46	22.2	1024.3	0
	1300	3	56	24.4	1024.0	0
	1900	3	128	22.3	1021.6	0
7	100	3	203	22.8	1020.9	0
	700	4	217	23.7	1020.9	0
	1300	5	133	27.6	1018.9	0
	1900	5	135	22.7	1018.9	0
8	100	0		20.2	1018.2	0
	700	1	103	23.2	1018.9	0
	1300	2	100	25.2	1017.9	0
	1900	1	337	22.9	1016.9	0
9	100	7	226	24.1	1016.2	0
	700	14	74	21.3	1016.9	14
	1300	3	225	25.5	1015.5	4
	1900	4	192	26.6	1013.8	0
10	100	5	189	24.3	1013.8	0
	700	7	223	25.0	1014.8	0
	1300	5	202	30.2	1014.8	0
	1900	5	195	28.0	1013.5	0
11	100	6	198	26.2	1015.2	0
	700	5	213	26.6	1016.5	0
	1300	6	206	31.9	1015.5	0
	1900	8	198	28.4	1015.2	0
12	100	7	211	26.3	1015.9	0
	700	7	208	26.6	1016.5	0
	1300	9	207	25.8	1015.2	9
	1900	7	206	26.2	1014.2	10
13	100	5	224	25.3	1014.5	0
	700	4	241	25.1	1016.2	0
	1300	4	79	28.5	1016.9	0
	1900	4	96	26.8	1016.5	0
14	100	2	347	24.1	1015.2	0
	700	6	235	25.8	1015.9	0
	1300	5	219	29.7	1014.5	0
	1900	3	210	28.9	1012.5	0
15	100	5	223	27.2	1013.1	0
	700	5	243	27.6	1013.8	0
	1300	3	96	33.1	1014.5	0
	1900	5	52	27.0	1015.2	0
16	100	2	83	26.1	1016.5	0
	700	2	106	26.8	1017.5	0
	1300	4	80	31.0	1018.6	0
	1900	4	184	30.0	1017.9	0

(Continued)

(Sheet 1 of 2)

Table 2: Meteorological Data

JUL 1988

Day	Hour	Wind	Wind	Temperature	Atm	Precipitation
		Speed m/sec	Direction deg TN	deg C	mb	mm
17	100	5	207	28.0	1017.9	0
	700	6	212	27.8	1017.9	0
	1300	7	203	33.0	1016.5	0
	1900	7	193	30.0	1014.2	0
18	100	9	210	28.2	1015.9	0
	700	8	227	27.5	1017.2	0
	1300	6	207	32.4	1016.9	0
	1900	5	274	27.8	1016.9	0
19	100	7	210	26.5	1018.6	0
	700	9	218	27.1	1019.2	0
	1300	15	175	32.6	1018.9	0
	1900	9	249	27.7	1019.9	0
20	100	8	213	26.5	1019.9	0
	700	8	219	27.1	1021.3	0
	1300	6	211	30.2	1021.3	0
	1900	6	188	27.6	1020.6	0
21	100	7	201	26.4	1020.6	0
	700	6	204	27.3	1020.3	0
	1300	7	210	29.2	1018.9	0
	1900	7	185	26.8	1016.9	0
22	100	6	206	26.5	1016.9	0
	700	6	197	23.4	1017.5	4
	1300	7	206	23.6	1018.2	3
	1900	5	227	24.5	1017.5	0
23	100	5	219	24.8	1018.2	0
	700	5	215	25.0	1018.9	0
	1300	7	199	26.6	1017.5	0
	1900	6	207	25.1	1016.5	0
24	100	7	251	24.7	1016.5	0
	700	6	297	23.1	1017.2	0
	1300	5	138	27.1	1017.2	0
	1900	3	177	24.7	1016.9	0
25	100	5	254	24.9	1017.5	0
	700	2	269	25.7	1018.2	0
	1300	4	178	28.3	1018.6	0
	1900	3	189	26.3	1017.9	0
26	100	3	220	25.0	1017.9	0
	700	3	162	23.9	1018.6	0
	1300	5	145	26.5	1017.9	0
	1900	5	211	26.6	1017.2	0
27	100	4	232	25.6	1018.9	0
	700	5	234	26.3	1019.9	0
	1300	5	202	30.9	1020.3	0
	1900	5	204	27.2	1019.9	0
28	100	4	306	24.9	1020.9	0
	700	4	219	23.7	1021.9	0
	1300	5	234	28.4	1022.3	0
	1900	5	251	26.2	1021.3	0
29	100	4	263	24.7	1022.6	0
	700	4	288	25.1	1023.6	0
	1300	3	243	30.6	1022.6	0
	1900	4	180	26.3	1021.3	0
30	100	5	253	26.5	1020.9	0
	700	5	268	27.1	1021.3	0
	1300	4	251	32.0	1019.9	0
	1900	5	215	28.6	1017.2	0
31	100	6	244	26.5	1016.9	0
	700	7	249	26.4	1017.2	0
	1300	5	247	31.9	1015.9	0
	1900	7	245	25.9	1014.8	5
		Resultant 3	207	Mean 25.9	Mean 1017.9	Total 49

(Sheet 2 of 2)

### PART III: WAVE DATA

Wave data are collected from two Baylor staff gages (Gages 625 and 645), a pressure wave gage (Gage 111) and a Waverider buoy (Gage 630) as shown in Table 1 and Figure 2. The data are collected, analyzed, and stored on magnetic tape using a Digital Equipment Corporation VAX 11/750 programmed to sample the wave gages every 6 hrs (more frequently during storms) near 0100, 0700, 1300, and 1900 EST. The sampling rate is two times per second for 34 minutes.

Wave height  $H_{mo}$  is an energy-based statistic equal to four times the standard deviation of the sea surface elevations. Wave height reported from the pressure gage has been compensated for hydrodynamic attenuation using linear wave theory. Wave period is identified from the computation of a variance (energy) spectrum with 60 deg of freedom calculated from a 34-min record. Peak wave period  $T_p$  is defined as the period associated with the maximum energy in the spectrum. When this analysis is complete, the data are written to magnetic tape.

Table 3 presents the wave heights and periods for each wave record obtained at 6 hr intervals during the month. The monthly means and standard deviations from the means shown in Table 3 are average values computed from this data. Figure 3 is a time history of all  $H_{mo}$  and  $T_p$  values obtained for all gages.

Differences in wave periods between wave gages (Table 3 and Figure 3) may be the result of wave breaking, wave reformation, or the presence of multiple wave trains containing nearly equal energy.

Table 3: Wave Data

Jul 1988

Day	Hour	645		625		111		630	
		Baylor at 7+80 Hmo,m	T.sec	Baylor at 19+00 Hmo,m	T.sec	Pressure Gage Hmo,m	T.sec	Farshr Wvrdr Hmo,m	T.sec
1	0100	0.24	4.49	0.48	8.53	0.50	8.53	0.54	9.14
	0700	0.88	3.94	0.98	4.06	0.96	4.06	0.99	4.06
	1300	0.89	5.33	*		0.98	5.22	1.12	5.33
	1900	0.62	6.40	0.69	5.82	0.74	5.69	0.78	5.57
2	0100	0.31	5.69	0.49	9.14	0.51	8.53	0.54	8.83
	0700	0.53	4.49	0.61	4.57	0.62	4.49	0.65	8.53
	1300	0.38	4.66	0.54	4.49	0.50	3.94	0.53	7.76
	1900	0.39	5.45	0.45	8.26	0.50	5.57	0.58	5.45
3	0100	0.35	4.83	0.44	8.53	0.38	8.00	0.49	8.00
	0700	0.24	7.53	0.40	7.76	0.38	7.53	0.42	7.53
	1300	0.21	7.76	0.34	8.53	0.35	8.53	0.36	8.26
	1900	0.36	2.98	0.48	8.26	0.38	8.26	0.53	3.01
4	0100	0.19	8.00	0.34	8.00	0.38	8.00	0.40	7.53
	0700	0.18	7.53	0.52	8.83	0.55	8.26	0.54	8.00
	1300	0.22	9.48	0.43	8.26	0.50	8.26	0.51	8.00
	1900	0.21	3.05	0.50	8.83	0.48	7.11	0.54	8.26
5	0100	0.29	9.48	0.48	9.14	0.52	8.83	0.60	8.53
	0700	0.21	9.48	0.49	8.83	0.56	8.53	0.58	7.76
	1300	0.40	9.14	0.61	9.14	0.63	8.53	0.72	8.83
	1900	0.34	2.56	0.69	8.83	0.73	8.83	0.82	8.83
6	0100	0.38	9.48	0.64	8.00	0.69	7.53	0.81	6.92
	0700	0.27	9.14	0.65	8.53	0.72	7.11	0.81	8.83
	1300	0.39	7.76	0.77	8.26	0.78	8.53	0.90	8.83
	1900	0.28	8.53	0.81	8.26	0.85	8.53	0.90	8.53
7	0100	0.41	9.85	0.88	9.14	0.97	8.53	0.82	7.76
	0700	0.26	10.24	0.76	8.83	0.92	9.48	0.79	8.83
	1300	0.36	10.24	0.69	8.53	0.83	10.67	0.80	9.48
	1900	0.32	10.67	0.76	9.85	0.93	9.48	0.78	9.48
8	0100	0.34	10.24	0.78	9.85	0.79	9.14	0.81	8.83
	0700	0.25	10.67	0.65	8.83	0.72	9.48	0.64	9.14
	1300	0.30	9.85	0.64	8.53	0.75	9.48	0.65	9.48
	1900	0.24	14.22	0.66	9.85	0.68	8.83	0.59	7.76
9	0100	0.28	14.22	0.62	9.48	0.60	9.14	0.57	7.53
	0700	0.86	3.88	0.99	3.61	0.93	3.88	0.83	3.66
	1300	0.27	12.19	0.44	12.19	0.53	7.76	0.56	7.76
	1900	0.33	12.80	0.56	7.76	0.57	7.76	0.54	7.11
10	0100	0.24	12.19	0.54	7.76	0.48	7.31	0.52	7.53
	0700	0.22	11.64	0.47	7.53	0.45	7.53	0.53	7.31
	1300	0.26	11.64	0.48	7.31	0.46	6.74	0.52	6.92
	1900	0.31	6.74	0.42	7.76	0.46	7.31	0.63	7.53
11	0100	0.20	12.80	0.38	6.92	0.43	6.92	0.51	6.40
	0700	0.31	7.53	0.46	7.53	0.47	8.00	0.60	7.76
	1300	0.21	12.19	0.48	6.74	0.47	7.76	0.54	6.40
	1900	0.34	4.00	0.45	8.26	0.52	3.41	0.66	8.26
12	0100	0.18	9.14	*		0.38	11.13	0.57	8.00
	0700	0.28	9.14	0.42	9.14	0.41	7.31	0.68	6.74
	1300	0.30	3.05	0.43	8.53	0.49	8.53	0.78	5.82
	1900	0.28	8.53	0.41	7.76	0.47	7.76	0.72	8.83
13	0100	0.22	7.76	0.43	7.76	0.49	8.26	0.69	6.92
	0700	0.26	9.48	0.49	8.83	0.57	8.53	0.76	7.11
	1300	0.19	9.14	0.42	8.26	0.51	8.83	0.61	6.74
	1900	0.31	8.26	0.49	9.48	0.54	8.53	0.71	7.11
14	0100	0.20	11.13	0.36	10.24	0.45	10.24	0.48	8.00
	0700	0.19	11.64	0.35	8.83	0.43	9.48	0.49	8.26
	1300	0.18	11.64	0.33	9.14	0.44	10.67	0.47	9.14
	1900	0.26	10.67	*	0.44	9.14	0.56	10.67	
15	0100	0.23	6.09	0.44	5.82	0.52	6.09	0.56	6.09
	0700	0.26	10.67	0.42	10.67	0.49	10.67	0.52	10.67
	1300	0.20	10.67	0.36	10.67	0.41	10.24	0.48	9.85
	1900	0.22	10.24	0.39	10.24	0.42	10.67	0.45	10.24
16	0100	0.21	10.67	0.41	10.24	0.45	10.24	0.47	10.24
	0700	0.22	10.24	0.38	10.24	0.41	10.24	0.47	9.14
	1300	0.17	10.67	0.35	9.85	0.41	9.48	0.48	9.48
	1900	0.21	10.24	0.40	8.83	0.47	10.24	0.44	9.14

\* Electronic problems

(Continued)

(Sheet 1 of 2)

Table 3: Wave Data

Jul 1988

Day	Hour	645			625			111			630		
		Baylor at 7+80	Hmo,m	T.sec	Baylor at 19+00	Hmo,m	T.sec	Pressure Gage	Hmo,m	T.sec	Farshr	Hmo,m	T.sec
17	0100	0.19	8.83	0.36	0.35	9.85	0.42	10.24	0.47	0.47	0.48	9.85	
	0700	0.19	9.85	0.35	10.24	0.38	9.48	0.48	0.48	0.48	9.48		
	1300	0.15	10.24	0.37	10.24	0.37	10.24	0.46	0.46	0.46	10.24		
	1900	0.27	3.56	0.41	9.85	0.44	8.53	0.69	0.69	0.69	3.82		
18	0100	0.20	10.24	0.33	9.85	0.36	9.85	0.56	0.56	0.56	8.26		
	0700	*		0.29	9.85	0.36	9.85	0.58	0.58	0.58	9.48		
	1300	0.21	3.20	0.34	9.85	0.37	9.85	0.42	0.42	0.42	9.14		
	1900	0.27	3.37	*		0.44	9.85	*			*		
19	0100	*		0.30	9.48	0.36	9.48	0.52	0.52	0.52	9.48		
	0700	*		0.33	9.48	0.37	9.48	0.63	0.63	0.63	2.48		
	1300	*		0.39	9.48	0.42	5.45	0.56	0.56	0.56	5.45		
	1900	0.28	17.07	0.41	9.14	0.44	3.28	0.70	0.70	0.70	5.22		
20	0100	0.18	16.00	0.31	17.07	0.35	17.07	0.53	0.53	0.53	5.57		
	0700	0.21	3.24	0.33	16.00	0.38	16.00	0.54	0.54	0.54	5.45		
	1300	0.19	15.06	0.33	16.00	0.40	16.00	0.49	0.49	0.49	5.57		
	1900	0.25	16.00	0.38	16.00	0.43	16.00	0.62	0.62	0.62	15.06		
21	0100	0.25	16.00	0.40	15.06	0.46	15.06	*	*	*	*		
	0700	0.23	16.00	0.41	15.06	0.48	15.06	*	*	*	*		
	1300	0.33	15.06	0.51	15.06	0.56	15.06	0.72	0.72	0.72	7.76		
	1900	0.43	15.06	0.59	14.22	0.70	14.22	0.83	0.83	0.83	5.45		
22	0100	0.36	3.66	0.57	6.40	0.66	6.56	1.00	1.00	1.00	6.24		
	0700	0.34	7.31	0.58	7.76	0.71	7.31	1.08	1.08	1.08	6.92		
	1300	0.37	6.92	0.60	6.92	0.72	13.47	0.95	0.95	0.95	6.56		
	1900	0.31	7.11	0.55	7.11	0.67	7.11	0.83	0.83	0.83	7.11		
23	0100	0.30	14.22	0.52	7.31	0.63	7.31	0.76	0.76	0.76	6.74		
	0700	0.31	6.92	0.53	6.92	0.66	6.56	0.76	0.76	0.76	5.33		
	1300	0.52	5.69	0.69	6.74	0.79	5.69	1.03	1.03	1.03	6.09		
	1900	0.36	3.66	0.57	6.92	0.70	5.22	0.90	0.90	0.90	6.92		
24	0100	0.35	6.40	0.59	6.09	0.72	5.95	0.88	0.88	0.88	5.95		
	0700	0.24	6.40	0.51	6.09	0.65	6.40	0.73	0.73	0.73	6.40		
	1300	0.31	8.26	0.56	8.26	0.62	8.83	0.69	0.69	0.69	6.09		
	1900	0.28	8.83	0.56	9.14	0.64	8.26	0.69	0.69	0.69	8.83		
25	0100	0.28	8.00	0.50	8.53	0.68	8.00	0.69	0.69	0.69	8.26		
	0700	0.22	8.53	0.57	8.53	0.62	8.53	0.68	0.68	0.68	8.53		
	1300	0.26	7.76	0.53	8.53	0.61	8.26	0.60	0.60	0.60	8.00		
	1900	0.23	8.26	0.47	8.26	0.50	8.26	0.57	0.57	0.57	8.26		
26	0100	0.20	7.76	0.46	7.76	0.53	8.26	0.57	0.57	0.57	8.00		
	0700	0.22	8.53	0.44	8.53	0.49	8.53	0.53	0.53	0.53	8.26		
	1300	0.27	8.26	0.46	8.26	0.50	8.26	0.56	0.56	0.56	8.26		
	1900	0.28	8.26	0.47	7.76	0.48	9.14	0.61	0.61	0.61	7.11		
27	0100	0.23	8.53	0.46	8.00	0.54	7.76	0.69	0.69	0.69	8.26		
	0700	0.26	9.48	0.47	9.85	0.55	9.14	0.64	0.64	0.64	8.26		
	1300	0.23	8.83	0.45	8.83	0.56	8.53	0.63	0.63	0.63	9.14		
	1900	0.36	9.48	0.55	9.48	0.59	8.53	0.72	0.72	0.72	9.48		
28	0100	0.23	9.48	0.48	8.83	0.59	9.48	0.70	0.70	0.70	9.14		
	0700	0.31	9.85	0.55	9.48	0.60	9.14	0.68	0.68	0.68	9.14		
	1300	0.21	9.14	0.46	8.53	0.53	8.83	0.54	0.54	0.54	8.83		
	1900	0.30	9.48	0.54	9.14	0.51	8.83	0.61	0.61	0.61	8.00		
29	0100	0.18	9.48	0.42	8.83	0.46	9.14	0.57	0.57	0.57	9.14		
	0700	0.24	8.83	0.39	9.48	0.46	8.53	0.49	0.49	0.49	8.83		
	1300	0.12	9.14	0.34	9.14	0.41	9.14	0.44	0.44	0.44	8.83		
	1900	0.23	8.26	0.43	7.76	0.46	8.53	0.47	0.47	0.47	8.53		
30	0100	0.14	8.53	0.35	9.14	0.42	8.53	0.44	0.44	0.44	8.53		
	0700	0.20	9.14	0.36	8.83	0.41	8.00	0.44	0.44	0.44	8.83		
	1300	0.13	14.22	0.28	8.00	0.38	8.53	0.39	0.39	0.39	8.26		
	1900	0.28	8.53	0.44	8.26	0.44	8.83	0.47	0.47	0.47	8.83		
31	0100	0.16	13.47	0.36	8.83	0.42	9.48	0.48	0.48	0.48	9.14		
	0700	0.23	8.83	0.45	9.14	0.45	8.53	0.56	0.56	0.56	8.53		
	1300	0.20	8.53	0.43	8.83	0.45	8.83	0.51	0.51	0.51	7.76		
	1900	0.28	9.14	*		0.50	8.53	0.60	0.60	0.60	8.83		
Mean		0.28	8.95	0.49	8.94	0.54	8.73	0.63	0.63	0.63	7.85		
Std dev		0.12	3.21	0.14	2.23	0.15	2.42	0.15	0.15	0.15	1.70		

\* Electronic problems

(Sheet 2 of 2)

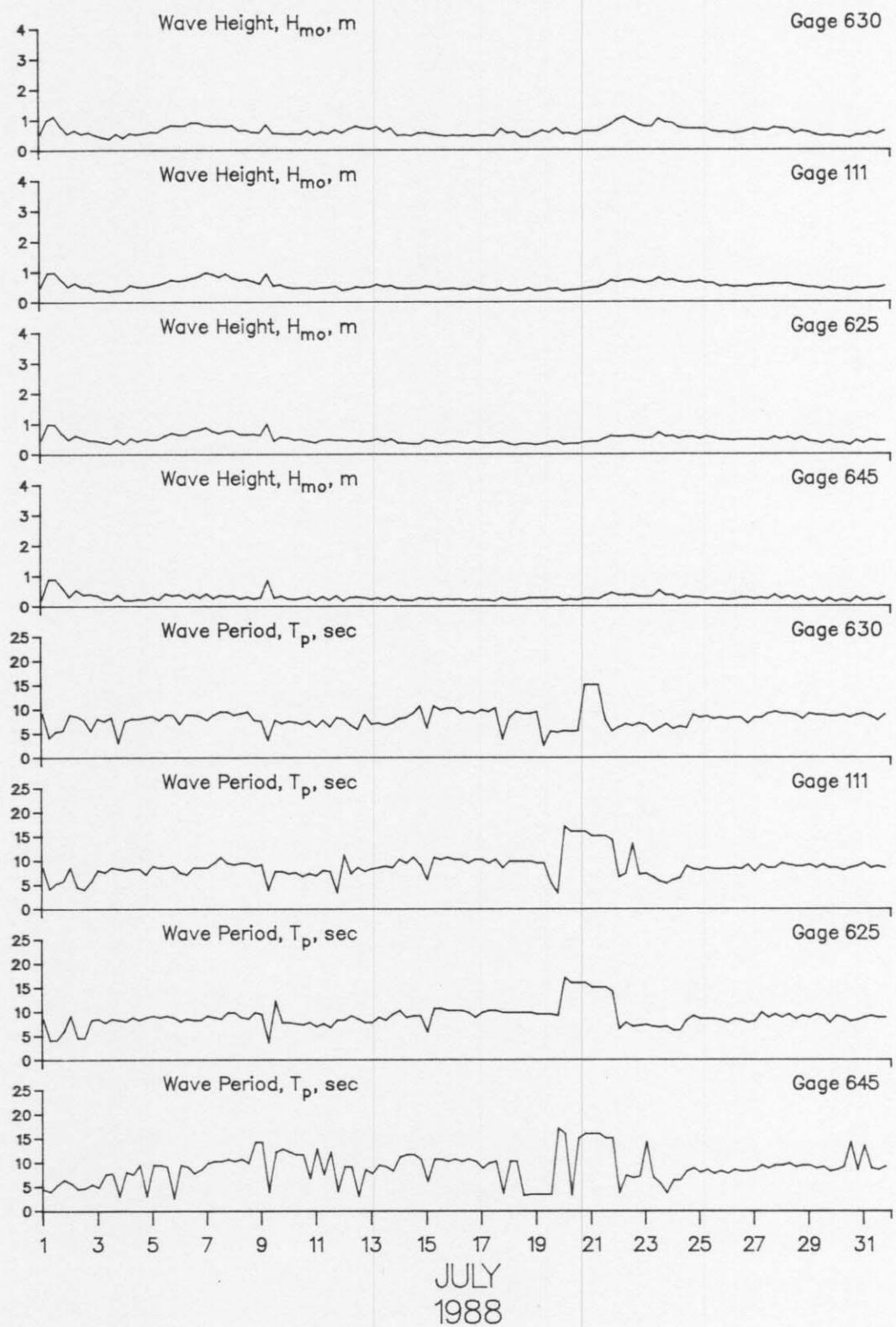


Figure 3. Time history of wave heights and periods

#### PART IV: CURRENT DATA

Current data (Table 4) are collected from a Marsh-McBirney electromagnetic biaxial current meter (Table 1 and Figure 2) and by visually observing the movement of dye on the water surface in the surf and at the seaward end of the pier, as well as 500 m updrift of the pier 12 m offshore.

Since the shoreline orientation is approximately N20W, longshore currents flow either toward 340 deg (i.e. northward) or toward 160 deg (i.e. southward). Similarly, cross-shore currents are either onshore (westward) or offshore (eastward).

All current speeds are given in centimeters per second (cm/sec). Resultant speeds and directions are determined by vector averaging the data.

Table 4: Current Data  
Jul 1988

Day	Alongshore Cross-shore Resultant Time	Pier Measurements				Beach Measurements (500m Updrift)			Current Meter at South Tripod	
		Dye at (579 m) (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir	Depth -4.8m (NGVD) ID #679
1	0100-Along Cross Result									6 N
1	0700-Along Cross Result	51 S 15 on 53 177	152	102 20 104	S on 171	64 S	North	16 4 16	S off 146	4 on 306
1	1300-Along Cross Result									19 S
1	1900-Along Cross Result									1 off 19 157
2	0100-Along Cross Result									2 S
2	0700-Along Cross Result	18 S 8 off 20 136	140	32 3 32	S off 154	38 N	South	6 0 6	S off 154	1 off 9 154
2	1300-Along Cross Result									13 S
2	1900-Along Cross Result									4 off 14 143
3	0100-Along Cross Result									1 S
3	0700-Along Cross Result	13 N 4 off 14 357	152	21 0 21	N 340	0	South	4 5 6	N on 289	0 on 289
3	1300-Along Cross Result									2 on 2 250
3	1900-Along Cross Result									19 N
4	0100-Along Cross Result									4 on 19 328
4	0700-Along Cross Result	18 N 0 340	152	47 0	N 340	30 N	South	6 5 10 3	N on 8 300	8 on 323
4	1300-Along Cross Result									3 N
4	1900-Along Cross Result									1 off 3 358
5	0100-Along Cross Result									20 N
5	0700-Along Cross Result	22 N 0 340	165	28 0	N 340	32 N	South	3 5 6	N off 6 39	3 on 15 329
5	1300-Along Cross Result									15 N
5	1900-Along Cross Result									1 off 15 344

KEY = All speeds in CM/SEC  
N = Northward, Shore parallel  
S = Southward, Shore parallel  
on = onshore off = offshore

Table 4: Current Data (Continued)

Jul 1988

Day	Alongshore Cross-shore Resultant Time	Pier Measurements				Beach Measurements (500m Updrift)			Current Meter at South Tripod				
		Dye at (579 m) (surface)	Speed	Dir	Dye at Mid-Surf Zone (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir	Depth -4.8m (NGVD)
6 0100	Along Cross Result										12	N	
6 0700	Along Cross Result	20 5	N on		165	0	0	0	88	N	16	N	
6 1300	Along Cross Result	20	326						North		1	on	
6 1900	Along Cross Result										16	N	
7 0100	Along Cross Result										4	on	
7 0700	Along Cross Result	41 2 41	N on 343		165	11 0 11	N 340		18	N	16	326	
7 1300	Along Cross Result										15	N	
7 1900	Along Cross Result										3	on	
8 0100	Along Cross Result										15	329	
8 0700	Along Cross Result	20 0 20	N 165 340		0 0 0				18	N	14	N	
8 1300	Along Cross Result								South		1	on	
8 1900	Along Cross Result										14	336	
9 0100	Along Cross Result										6	N	
9 0700	Along Cross Result	17 14 22	N off 19		165	16 19 25	N off 30		34	N	1	on	
9 1300	Along Cross Result										1	250	
9 1900	Along Cross Result										0	N	
10 0100	Along Cross Result										0	9	
10 0700	Along Cross Result	0 9 9			165	36 16 39	N off 4		58	N	0	340	
10 1300	Along Cross Result								South		6	off	
10 1900	Along Cross Result										6	70	

KEY = All speeds in CM/SEC

N = Northward, Shore parallel

S = Southward, Shore parallel

on = onshore off = offshore

Table 4: Current Data (Continued)  
Jul 1988

Day	Pier Measurements						Beach Measurements (500m Updrift)			Current Meter at South Tripod	
	Alongshore Cross-shore Resultant		Dye at (579 m) (surface)		Dye at Mid-Surf Zone (surface) Distance from Baseline (m)		Dye 12m offshore (surface)			Depth -4.8m (NGVD)	ID #679
Time	Speed	Dir	Speed	Dir	Speed	Dir	Location	Speed	Dir	Speed	Dir
11 0100-Along Cross Result										9	N
11 0700-Along Cross Result	0				68	N				1	on
	10	off	152		20	off	South	12	N	3	S
	10	70			71	357				3	on
11 1300-Along Cross Result										4	N
11 1900-Along Cross Result										4	on
										6	295
12 0100-Along Cross Result										14	N
12 0700-Along Cross Result	17	N			61	N		41	N	1	S
	10	off	152		3	off	South			5	on
	20	11			61	343				5	239
12 1300-Along Cross Result										8	N
12 1900-Along Cross Result										7	on
										11	299
13 0100-Along Cross Result										13	N
13 0700-Along Cross Result	10	S			47	N		35	N	4	on
	4	off	152		7	off	South			5	232
	10	136			47	349				5	107
13 1300-Along Cross Result										1	S
13 1900-Along Cross Result										1	off
										1	115
14 0100-Along Cross Result										3	N
14 0700-Along Cross Result	0				36	N		67	N	2	on
	10	off	152		11	off	South			2	off
	10	70			37	357				9	70
14 1300-Along Cross Result										6	S
14 1900-Along Cross Result										0	off
										6	160
15 0100-Along Cross Result										5	N
15 0700-Along Cross Result	18	N			28	N		0		2	on
	6	off	152		0		South			5	318
	19	357			28	340				1	off
15 1300-Along Cross Result										5	351
15 1900-Along Cross Result										2	S
										4	off
										4	97
										3	on
										4	284

KEY = All speeds in CM/SEC  
 N = Northward, Shore parallel  
 S = Southward, Shore parallel  
 on = onshore off = offshore

Table 4: Current Data (Continued)  
Jul 1988

Alongshore Cross-shore Resultant Time	Pier Measurements						Beach Measurements (500m Updrift)			Current Meter at South Tripod		
	Dye at (579 m) (surface)	Speed	Dir	Dye at Mid-Surf Zone (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir	Depth -4.8m (NGVD) ID #679
Day												
16 0100-Along Cross Result										1	S	
16 0700-Along Cross Result	9 0 9	N off 340		21 0 21	N 340			33 S	South	2	on	223
16 1300-Along Cross Result										6	S	
16 1900-Along Cross Result										1	off	
16 1900-Along Cross Result										4	S	
17 0100-Along Cross Result										6	N	
17 0700-Along Cross Result	28 10 29	N off 359		32 8 33	N off 354			35 N	South	3	on	
17 1300-Along Cross Result										7	313	
17 1900-Along Cross Result										2	N	
18 0100-Along Cross Result										3	on	
18 0700-Along Cross Result	8 20 21	N off 47		41 4 41	N off 346			65 N	South	4	S	
18 1300-Along Cross Result										5	on	
18 1900-Along Cross Result										18	324	
19 0100-Along Cross Result										5	N	
19 0700-Along Cross Result	29 20 35	N off 15		28 8 29	N off 357			11 N	South	6	on	
19 1300-Along Cross Result										7	277	
19 1900-Along Cross Result										4	S	
20 0100-Along Cross Result										4	on	
20 0700-Along Cross Result	24 7 25	N off 357		36 4 36	N off 346			21 N	South	6	N	
20 1300-Along Cross Result										7	284	
20 1900-Along Cross Result										2	N	
										5	on	
										5	272	
										10	N	
										3	on	
										10	323	

KEY = All speeds in CM/SEC  
 N = Northward, Shore parallel  
 S = Southward, Shore parallel  
 on = onshore off = offshore

Table 4: Current Data (Continued)  
Jul 1988

Day	Pier Measurements				Beach Measurements (500m Updrift)				Current Meter at South Tripod		
	Alongshore Cross-shore Resultant Time	Dye at (579 m) (surface)	Dye at Mid-Surf Zone (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir	Depth -4.8m (NGVD) ID #679
21 0100-Along Cross Result									10	N	
									3	on	
									10	323	
21 0700-Along Cross Result	29 7 30	N off 354		171 11 57	55 351	N off		30 N	6 5 8	N on 300	
21 1300-Along Cross Result									2 6 6	N on 268	
21 1900-Along Cross Result									17 4 17	N on 327	
22 0100-Along Cross Result									11 6 13	N on 311	
22 0700-Along Cross Result	5 3 6	N off 11		189	68 7 68	N off		49 N	4 5 6	N on 289	
22 1300-Along Cross Result									1 5 5	N on 261	
22 1900-Along Cross Result									6 5 8	N on 300	
23 0100-Along Cross Result									7 2 7	N on 324	
23 0700-Along Cross Result	18 6 19	N off 357		177	68 20 71	N off		32 N	7 3 8	N on 317	
23 1300-Along Cross Result									13 4 14	N on 323	
23 1900-Along Cross Result									17 2 17	N on 333	
24 0100-Along Cross Result									5 5 7	N on 295	
24 0700-Along Cross Result	24 2 25	S off 154		189	44 0 44	N		18 N	3 2 4	S on 194	
24 1300-Along Cross Result									8 5 9	S off 128	
24 1900-Along Cross Result									1 1 1	N on 295	
25 0100-Along Cross Result									3 4 5	N on 287	
25 0700-Along Cross Result	0 0 0			189	34 15 37	N off		44 N	6 2 6	S on 178	
25 1300-Along Cross Result									1 1 1	S off 115	
25 1900-Along Cross Result									4 1 4	S on 174	

KEY = All speeds in CM/SEC  
 N = Northward, Shore parallel  
 S = Southward, Shore parallel  
 on = onshore off = offshore

Table 4: Current Data (Continued)  
Jul 1988

Day	Alongshore Cross-shore Resultant Time	Pier Measurements				Beach Measurements (500m Updrift)			Current Meter at South Tripod				
		Dye at (579 m) (surface)	Speed	Dir	Dye at Mid-Surf Zone (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir	Depth -4.8m (NGVD)
26 0100-Along Cross Result											3	S	
26 0700-Along Cross Result	6 5 8	S off 118			30 3 31	N off 346			27 South	N	4 2 4	S on 205	
26 1300-Along Cross Result											1	S	
26 1900-Along Cross Result											0		
26 1900-Along Cross Result											1	160	
27 0100-Along Cross Result											5	N	
27 0700-Along Cross Result	23 7 24	N off 357			55 0 55	N 340			30 South	N	3 3 4	S on 205	
27 1300-Along Cross Result											4	N	
27 1900-Along Cross Result											4 2 14	on 332	
28 0100-Along Cross Result											3	N	
28 0700-Along Cross Result	0 0 0				41 12 42	N on 323			21 South	N	6 1 6	S off 151	
28 1300-Along Cross Result											1 2 2	on 223	
28 1900-Along Cross Result											5 3 6	N on 309	
29 0100-Along Cross Result											2	N	
29 0700-Along Cross Result	20 12 24	N off 11			38 23 44	N off 11			0 South		3 1 3	S off 142	
29 1300-Along Cross Result											7 5 9	S off 124	
29 1900-Along Cross Result											11 0 11	S 160	
30 0100-Along Cross Result											8 0 8	S 160	
30 0700-Along Cross Result	15 1 15	S on 163			16 1 16	N on 337			13 South	N	5 2 5	S on 182	
30 1300-Along Cross Result											7 3 8	S off 137	
30 1900-Along Cross Result											3 4 5	N on 287	

KEY = All speeds in CM/SEC  
 N = Northward, Shore parallel  
 S = Southward, Shore parallel  
 on = onshore off = offshore

Table 4: Current Data (Concluded)  
Jul 1988

Day	Alongshore Cross-shore Resultant Time	Pier Measurements				Beach Measurements (500m Updrift)			Current Meter at South Tripod	
		Dye at (579 m) (surface)	Distance from Baseline (m)	Speed	Dir	Dye 12m offshore (surface)	Location	Speed	Dir	Depth -4.8m (NGVD)
31 0100	-Along Cross Result									Speed
31 0700	-Along Cross Result	7 12 14	N off 41			29 9 30	N off 357	20	N	Dir
31 1300	-Along Cross Result						South			
31 1900	-Along Cross Result									

KEY = All speeds in CM/SEC  
 N = Northward, Shore parallel  
 S = Southward, Shore parallel  
 on = onshore off = offshore

#### PART V: SUPPLEMENTAL OBSERVATIONS

Visual wave direction measurements (Table 5) taken at the seaward end of the pier are made of both the primary wave train (i.e. that having the larger wave heights) and the secondary wave train (which must be clearly distinguishable as a wave train separate from the primary waves but not surface chop or capillary waves). The direction of the primary wave train just north of the seaward end of the pier is also determined using a Raytheon Marine Pathfinder radar and measuring the alignment of the wave crests. The pier axis (considered perpendicular to the beach at the FRF) is orientated 70 deg east of true north; consequently, wave angles greater than 70 deg indicate that the waves were coming from the south side of the pier.

The width of the surf zone (seawardmost breaker position to shoreline) is determined from the pier deck.

Measurements of surface water temperature, density, and visibility are made daily at the seaward end of the FRF pier. A jar along with a thermometer is lowered about 0.3 m into the water and allowed to remain for at least one minute. The jar is removed, the temperature read, and a hydrometer is used to determine the density. A Secchi disc is used to determine the surface visibility.

Table 5: Supplemental Observations

Jul 1988

Day	Time	Wave Approach		Radar Wave Angle deg from True N	Width of Surf Zone,m	Water Characteristics at Pier End		
		Primary	Secondary			Temp.,C	Density g/cc	Secchi Vis.,m
1	0640	20			90	21.1	1.0228	2.1
2	0630	25			56	21.1	1.0224	3.4
3	0635	120			51	22.3	1.0216	3.4
4	0630	90	120		75	22.8	1.0220	4.6
5	0635	110	30		77	22.8	1.0222	4.0
6	0700	90	40		79	23.6	1.0228	4.9
7	0640	90			99	23.4	1.0222	3.0
8	0640	80			105	20.3	1.0238	1.8
9	0715	110	90		62	18.9	1.0243	1.2
10	0810	none visible			75	18.4	1.0246	3.0
11	0720	90			54	17.8	1.0246	4.3
12	0630	110			33	17.8	1.0246	3.7
13	0645	120			43	19.5	1.0248	4.6
14	0640	none visible			2	20.0	1.0246	4.3
15	0640	120			51	22.8	1.0240	6.7
16	0825	none visible			17	25.6	1.0232	7.3
17	0815	none visible			40	21.7	1.0238	4.6
18	0700	none visible			48	20.0	1.0248	2.1
19	0715	130			37	21.1	1.0248	3.7
20	0640	120			55	21.1	1.0250	3.4
21	0645	130			69	21.7	1.0250	4.0
22	0635	100			82	21.1	1.0252	2.7
23	0740	120			10	21.1	1.0252	3.4
24	0815	110			100	21.1	1.0250	2.4
25	0650	100			58	21.1	1.0249	4.0
26	0630	120	140		60	21.7	1.0250	4.0
27	0630	100			40	21.1	1.0250	4.6
28	0630	110			47	21.7	1.0250	3.4
29	0630	100			41	21.7	1.0250	4.3
30	0800	none visible			38	23.6	1.0234	5.5
31	0845	none visible			28	22.2	1.0245	4.3

## PART VI: WATER LEVELS

The National Ocean Services (NOS) has established a primary tide station (No. 865-1370) at the seaward end of the FRF pier. A Leupold-Stevens digital recording float-type tide gage is used to collect data every 6 minutes throughout the month.

Figure 4 shows the variation in mean water levels computed over a tidal cycle period (12.42 hours) and contains a list of selected mean and extreme values. This presentation is useful in identifying effects of both meteorological and astronomical forces on the open coast water levels.

Table 6 contains the time of the center of each sampling interval and the range, high, low, and mean water levels during each tidal cycle.

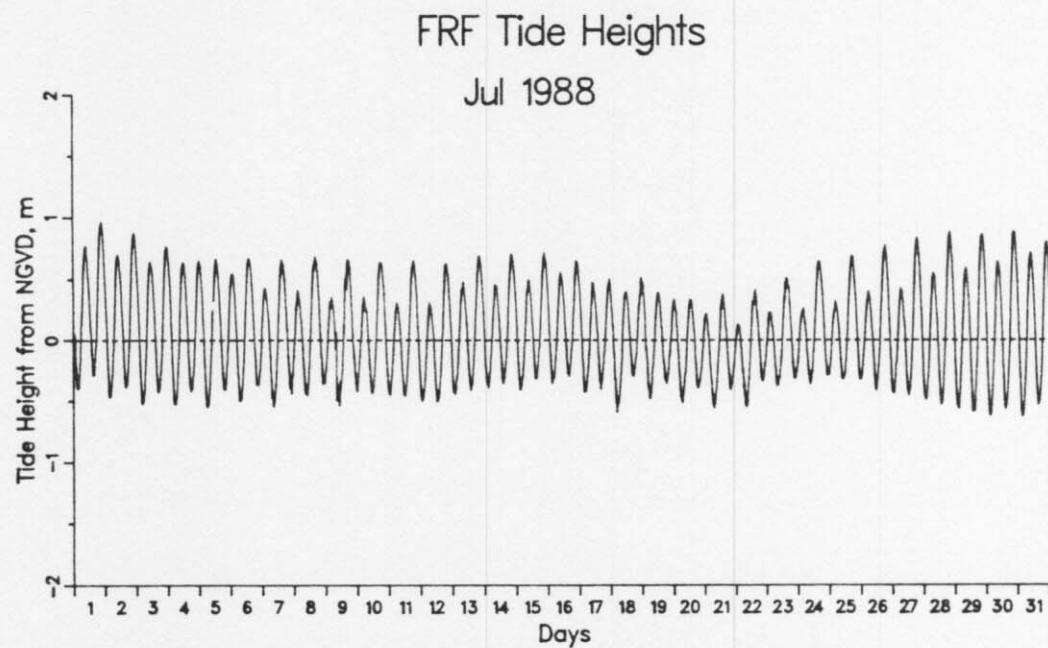


Figure 4. Time history of mean water levels

**Monthly Water Levels, m NGVD**

Extreme Low	=	-0.62 on day 31 at 236 hr
Extreme High	=	0.97 on day 1 at 2036 hr
Monthly Mean	=	0.07
Mean Low	=	-0.44
Mean High	=	0.57
Mean Range	=	1.01

Table 6: Water Levels, m NGVD

		Jul 1988			
Mid-Cycle Day	Time	Low	High	Mean	Range
1	612	-0.40	0.78	0.20	1.17
1	1837	-0.29	0.97	0.35	1.26
2	703	-0.47	0.70	0.13	1.17
2	1928	-0.38	0.88	0.25	1.26
3	753	-0.52	0.65	0.08	1.17
3	2018	-0.43	0.77	0.17	1.19
4	843	-0.52	0.64	0.07	1.16
4	2109	-0.42	0.66	0.11	1.08
5	934	-0.55	0.67	0.07	1.21
5	2159	-0.40	0.55	0.07	0.95
6	1024	-0.50	0.68	0.11	1.18
6	2249	-0.37	0.43	0.02	0.80
7	1115	-0.54	0.66	0.09	1.21
7	2340	-0.44	0.41	0.01	0.85
8	1205	-0.45	0.69	0.14	1.14
9	30	-0.36	0.36	0.01	0.72
9	1255	-0.54	0.67	0.09	1.21
10	121	-0.42	0.36	-0.01	0.77
10	1346	-0.43	0.64	0.12	1.08
11	211	-0.45	0.31	-0.05	0.76
11	1436	-0.46	0.66	0.10	1.11
12	301	-0.50	0.31	-0.08	0.81
12	1527	-0.50	0.63	0.05	1.13
13	352	-0.44	0.48	0.02	0.92
13	1617	-0.41	0.69	0.15	1.10
14	442	-0.39	0.46	0.04	0.85
14	1707	-0.35	0.71	0.18	1.06
15	532	-0.41	0.50	0.05	0.91
15	1758	-0.32	0.72	0.19	1.04
16	623	-0.35	0.55	0.10	0.91
16	1848	-0.30	0.65	0.17	0.94
17	713	-0.43	0.48	0.00	0.91
17	1938	-0.40	0.50	0.04	0.91
18	804	-0.59	0.40	-0.07	0.99
18	2029	-0.30	0.52	0.08	0.81
19	854	-0.48	0.39	-0.03	0.87
19	2119	-0.36	0.34	-0.04	0.69
20	944	-0.51	0.34	-0.06	0.85
20	2210	-0.40	0.22	-0.12	0.62
21	1035	-0.55	0.38	-0.07	0.94
21	2300	-0.41	0.13	-0.15	0.54
22	1125	-0.54	0.42	-0.03	0.96
22	2350	-0.34	0.23	-0.06	0.57
23	1216	-0.37	0.51	0.09	0.88
24	41	-0.32	0.27	-0.04	0.58
24	1306	-0.36	0.65	0.17	1.01
25	131	-0.29	0.32	0.00	0.62
25	1356	-0.32	0.69	0.19	1.01
26	222	-0.33	0.40	0.03	0.73
26	1447	-0.41	0.78	0.20	1.19
27	312	-0.44	0.43	-0.01	0.86
27	1537	-0.45	0.84	0.20	1.29
28	402	-0.49	0.55	0.03	1.04
28	1628	-0.53	0.88	0.18	1.41
29	453	-0.56	0.59	0.02	1.15
29	1718	-0.59	0.86	0.15	1.45
30	543	-0.62	0.64	0.02	1.26
30	1808	-0.56	0.88	0.17	1.44
31	634	-0.62	0.71	0.06	1.34
31	1859	-0.53	0.80	0.14	1.33

## PART VII: NEARSHORE PROFILES

A. Nearshore Profiles. In order to document profile response away from the pier, surveys of four profile lines extending 900 to 1,000 m from shore and located 489 and 581 m north and 517 and 608 m south of the FRF pier are conducted bi-weekly, after storms, and during more complete bathymetric surveys.

These profiles are obtained using the CRAB-Zeiss surveying system; a Zeiss Elta-2 first-order, self-recording electronic theodolite distance meter in combination with the Coastal Research Amphibious Buggy (CRAB), a 10.7 m high, self-powered, mobile tripod on wheels.

Figure 5 shows the last survey in June and the two surveys in July on profile line 188, located 517 m south of the pier. In response to the low wave conditions during July the nearshore bar (160 to 320 m) migrated 60 m shoreward while the foreshore (100 to 160 m) accreted up to 0.5 m. Changes to the remainder of the profile were minor.

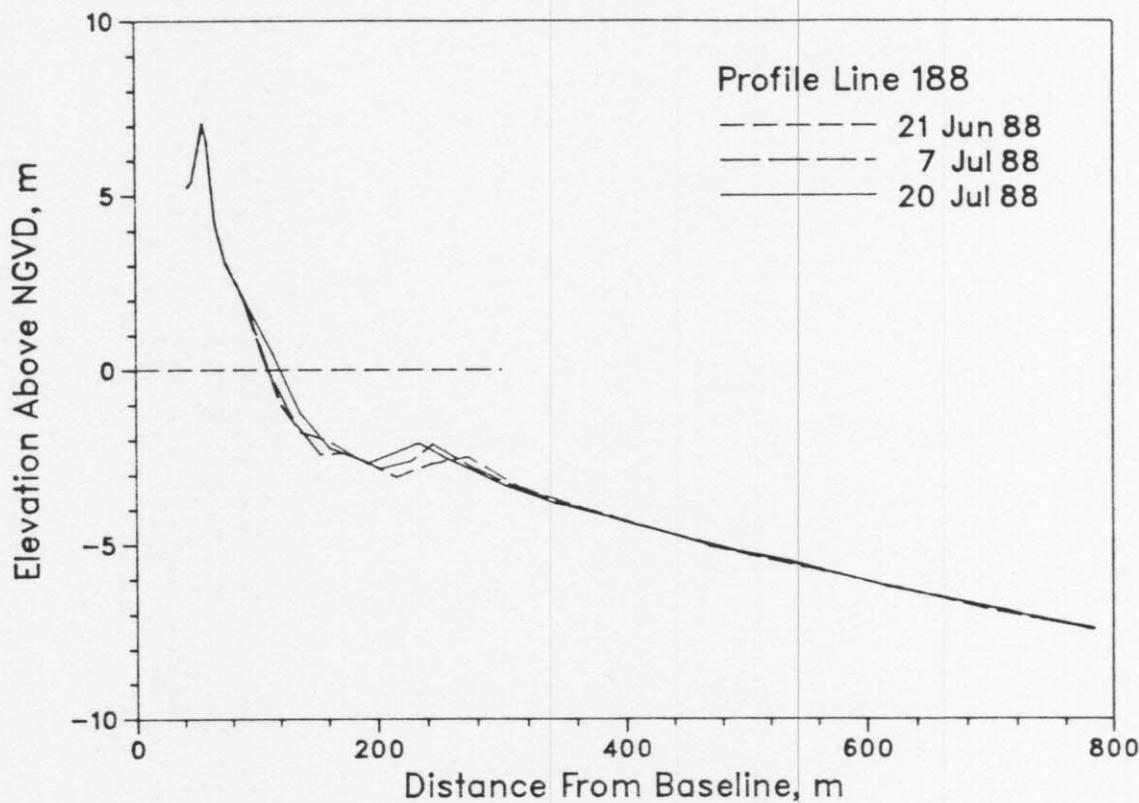


Figure 5. Monthly CRAB profiles on profile 188 - 517 m south of pier.

The profile envelope (Figure 6) reflects the maximum changes that occurred on the profile during 1988. The only change visible (100 to 140 m) is a result of the accretion on the foreshore.

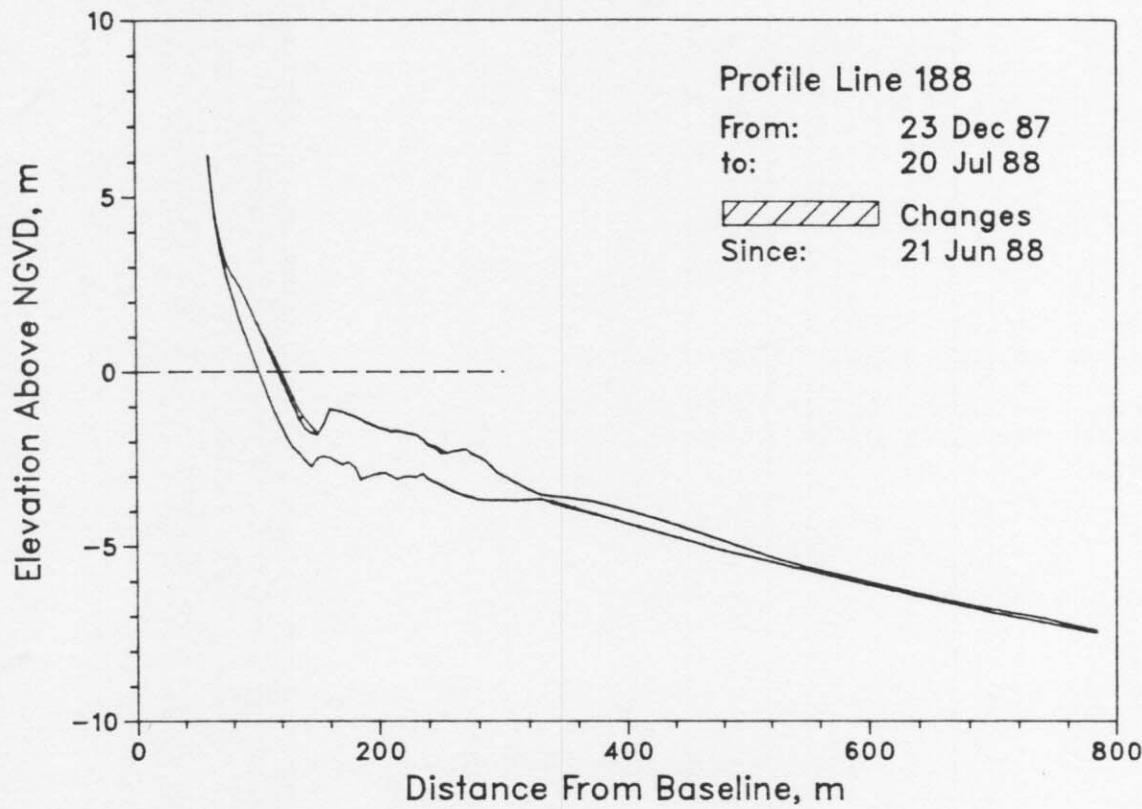


Figure 6. CRAB profile envelope - profile 188.

B. Bathymetry. Figure 7 includes a two- and three-dimensional contour map and a change plot derived from the bathymetric survey conducted on 8 July. Wide contour lines on the change diagram represent areas which eroded; thin lines indicate accretion.

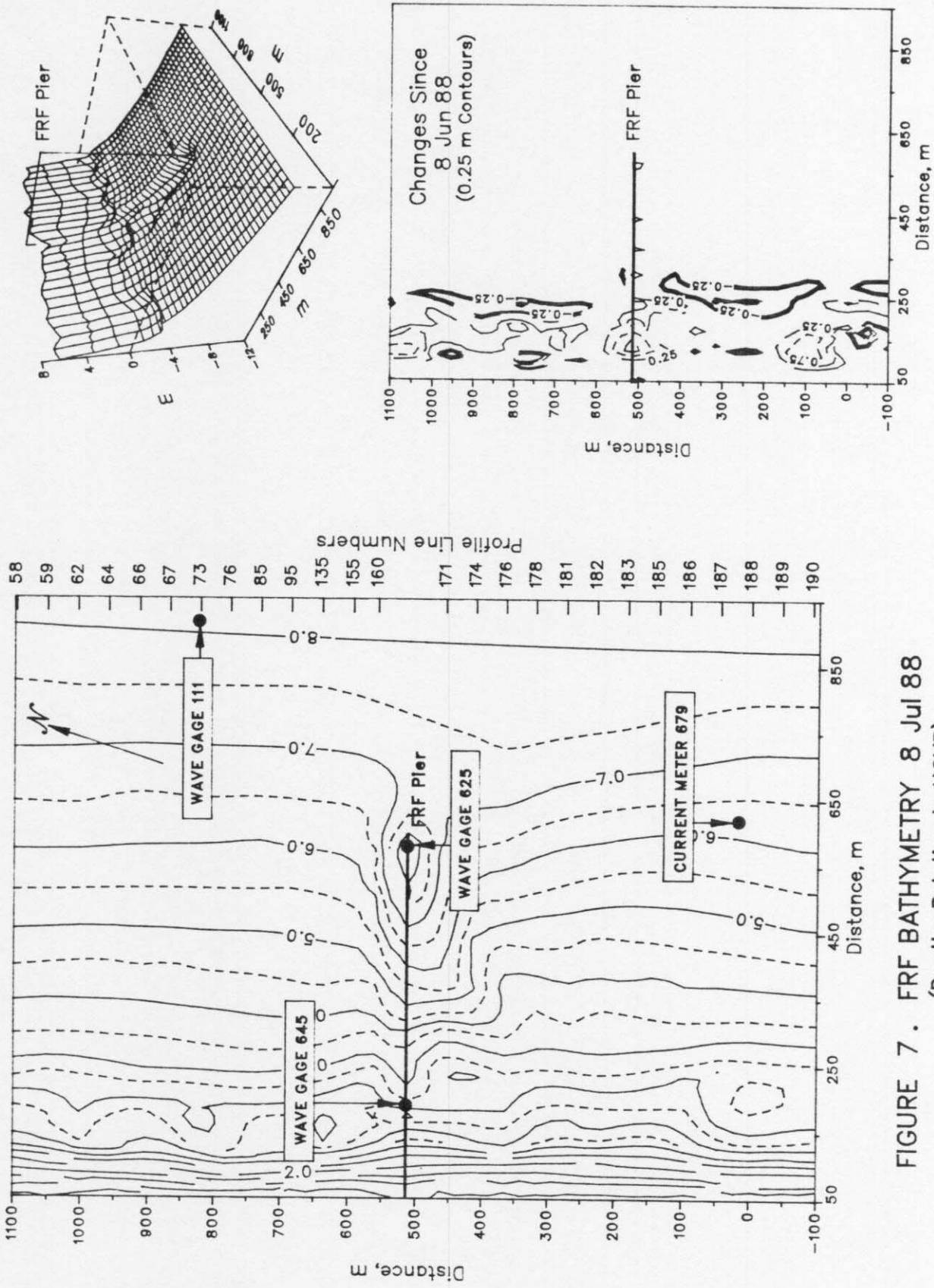


FIGURE 7. FRF BATHYMETRY 8 Jul 88  
(Depths Relative to NGVD)

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